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IT'S NEVER TOO L.A.T.E.: IT'S ALL ABOUT LEARNING GOALS, ASSESSMENT, TASKS & ENGAGEMENT

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WHO DOESN'T BELONG? WHY?

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ABOUT THIS SESSION



LEARNING GOALS | TASKS | ASSESSMENT | ENGAGEMENT

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LEARNING GOALS

- First things first: Having clarity of the learning goal is core to preparing for and facilitating effective instruction.

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LEARNING GOALS

- Two important questions:
  - What is stated in the learning goal?
  - What is the intent of the learning goal?

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GEOMETRY & MEASUREMENT

- The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to distinguish between attributes that define a two-dimensional or three-dimensional figure and attributes that do not define the shape.

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GEOMETRY & MEASUREMENT

- "Germane to effective verbal interactions is the use of vocabulary".

(Sigmon, Ming & Herring, 2002)

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CONCEPT ATTAINMENT MODEL

- "The model is an instructional approach in which teachers guide students to derive an abstract, generic idea inductively using pattern recognition and categorizing skills, then help them deductively apply the concept in new situations".

(Pritchard, 1994)

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CONCEPT ATTAINMENT MODEL

Examples
Non-examples
Which are examples? Which are not? Why?
Define/Name

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Concept Attainment Model

(Pritchard, 1994)

Examples
Non-examples
Which of these are examples?
Define/Name.

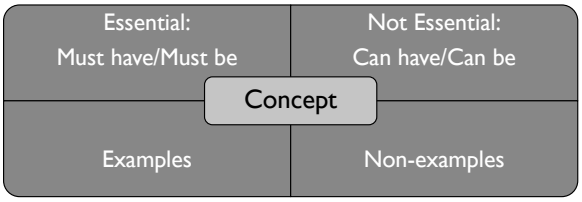
FRAYER MODEL

- "When using the Frayer Model, the focus should be on leading students to clarify their understanding of vocabulary and to develop their ability to use words with the correct context".

(Plankers, 2022)

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FRAYER MODEL



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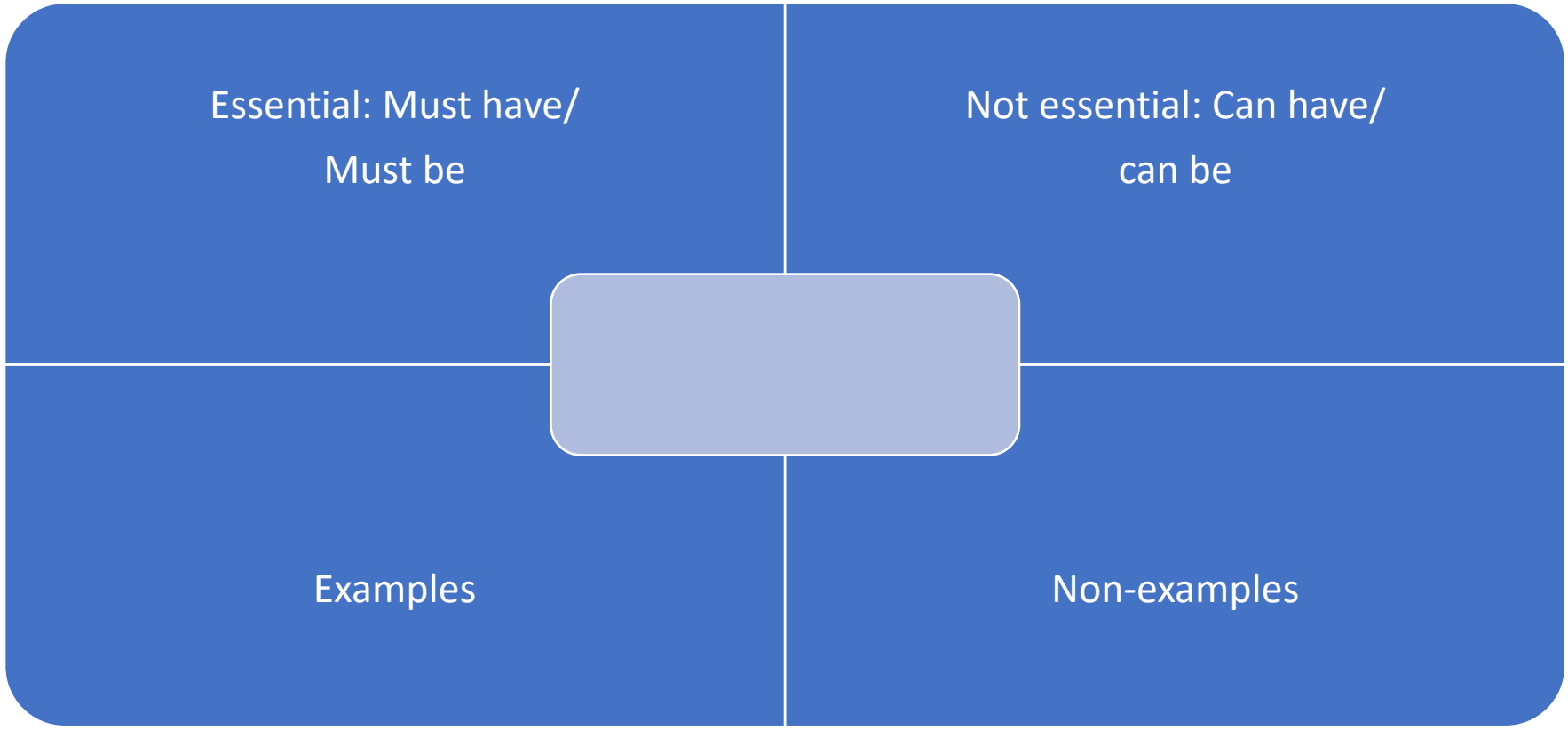
LEARNING GOALS TELL US…

1. What concepts want students to learn
2. What skills we want students to learn
3. What processes we want students to learn
4. What strategies we want students to learn
5. What mathematical connections and relationships we want students to make
6. What mathematical vocabulary we want students to use
7. What applications we want students to engage
8. What foundations we want students to build

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Frayer Model

(Plankers, 2022)



TASKS

- Select appropriate **T**asks to support identified learning goals.
- Facilitate productive **Q**uestioning to engage students in mathematical practices.
- Collect and use student **E**vidence in the formative assessment process.

(Dixon, Nolan, Adams, Brooks, & Howse, 2016)

The TQE Process



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SELECTING TASKS

- Learning goal
- Grade level/band
- Content
- Cognitive demand
- Conceptual target(s)
- Procedural/skill target(s)
- Connection(s) or application(s)

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TASKS

- "Teachers with a deep understanding of the content they teach select tasks that provide students with the opportunity to engage in practices that support learning concepts before procedures; they know that for deep learning to take place, students need to understand the procedures they use."

(Dixon, Nolan, Adams, Brooks, & Howse, 2016)

The TQE Process



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SELECTING TASKS

- Being intentional about the selection of tasks is a valuable approach to lesson planning.

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ASSESSMENT: DISCOURSE

- "Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments".

(National Council of Teachers of Mathematics)

What missing operations did you consider?

What missing numerals did you consider?

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ASSESSMENT: DISCOURSE

Given 8 + 7 – 2….= 72

nsert three more operations and threDiscuss again.

What missing operations did you consider?What missing numerals diCompare with others.

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Tasks

1. Show four ways to solve 149 + 286.

2. Determine a real-world situation that can be represented by $y = \frac{3}{4}x + 6$.

3. Goldbach's Conjecture: Every even number greater than 2 may be expressed as the sum of two prime numbers. For example:

   4 = 2 + 2 8 = 5 + 3

   6 = 3 + 3 10 = 5 + 5

   Is Goldbach's conjecture valid for every even number from 12 to 50?

4. Show the result of 6 divided by 2/3 without using "invert & multiply".

ASSESSMENT: DISCOURSE

- "…teachers are responsible for providing students with opportunities to engage in mathematical discourse across different modalities (e.g., speaking and writing)".

(Smith, 2021)

What missing operations did you consider?

What missing numerals did you consider?

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ASSESSMENT: DISCOURSE

Mathematical discourse can be supported by a variety of actions, such as…

Responding	Agreeing/Disagree
Demonstrating	Questioning
Compare with others.	Explaining
Advising	Debating
Writing	Presenting
Drawing	Constructing
Describing	Defining

What missing operations did you consider?

What missing numerals did you consider?

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ASSESSMENT: QUESTIONS

- "…different types of questions prompt different levels of thinking and elicit different levels of responses from students".

(Boston, Candela, & Dixon, 2019, p. 58)

What missing operations did you consider?

What missing operations did you consider?

What missing numerals did you consider?

Compare with others.

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ASSESSMENT: ASSESSING QUESTIONS

- Examples
- Nonexamples
- Explanations
- A look at how concepts relate
- Probing thoughts
- Whether learner has tried a particular route

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ASSESSMENT: ADVANCING QUESTIONS

- Clarifying information
- A different case
- A generalization
- Alternate explanations
- Applications of the content

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ENGAGEMENT

- Discourse, in its variety of forms, in the mathematics classroom is plays an important role of engaging each student the mathematics experience.

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"Make a Ten" Transcript

Focus: Examine the transcript to explore the types of questions used to support this task during instruction. Identify examples of advancing and assessing questions. You may use the line numbers for reference.

Teacher: Class we've been working on a lot of addition strategies learning how to add numbers, and it's been really fun. And today we are going to work on a task that involves adding numbers. "Kim went to a county fair. She played a game and won seven rubber bracelets. She played another game and won eight bouncing balls. How many prizes did Kim win at the fair?" What I'd like for you to do is use the tools on your table and work on this task.

GROUP 1

Teacher: Can you tell me what you've done here?

Student 1: I'm gonna add these together so I don't get confused which one is the bracelets and the balls. So, I'm gonna write down on the board have I get add then and one equals to…

Teacher: How did you get it to equal to that number? What did you do?

Student 1: I counted them in all.

Teacher: Can you show me how you did that?

Student 1: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15.

Teacher: And that's how you got how many prizes? Did you hear what he said? What did you do with yours?

Student 2: I count mine by 15, so that's how I get my answers.

Teacher: Is that what you did? Thank You

Teacher: Class, lets come back together. So, I walked around, and I've seen some of the strategies that you've been using as your work on the problem by yourself. What I want you to do now is share what your strategies were with each other.

GROUP 2

Teacher: So, what strategies have you all been working on over here? I see you have something on the board there. What is that?

Student 3: Well, this is what I put. Well, there's 8 and 7. I broke it up into the two parts. There's a 5 and there's a 2 on the 7. There's a 5 and a 3, then, first I add the two 5's which make 10 and the 2 and 3 made 5. So, when I add the 10 and the 5 made 15. So, 7+8 is 15.

Teacher: Thank you. Now the other part of this work I saw this. This is part of her strategy. Can you explain to me what you think she did in this strategy?

Student 4: She put 7+8, but all of this made 10.

Teacher: All of what made 10?
Student 4: In this row made 10.

Teacher: So, what do the reds represent?

Student 4: 7.

Teacher: What do the three represent?

Student 4: 10.

Teacher: All together, but where did she get the 3 from? Where did the 3 come from?

Student 4: The 8.

Teacher: From the 8. So how many prizes did she win at the fair?

Student 4: 15

Teacher: 15

Teacher: So, what did you do for your strategy?

Student 5: I put 7 there. Then I put 8 up here.

Teacher: And then what did you do?

Student 5: And then I added, and then it turned to 15.

Teacher: It turned to 15. How can you be sure it turned to 15?

Student 5: I counted it, and then it was 15.

Teacher: You got it.

Teacher: Class, let's come back together. I've seen a lot of strategies that you been using to add for this particular task. Who are used the 10 frame and can share with us what they did? Yes.

Teacher: Would you come to the board and show us what you did?

Student 6: I used 10 over here as in to do 1, 2, 3, 4, 5, 6, 7 over here. That's 7, and now I use 3 blocks from here. And , then I draw 1, 2, 3, 4, 5, 6, 7, 8, and I add them together.

Teacher: And what is the sum?

Student: 15.
Teacher: You got it. Thank you.

Teacher: Thanks so much for showing me all of the different addition strategies that you were able to do, and I really like that you are using different strategies and able to share what you did with each other.

ENGAGEMENT

- Tasks that are open-ended, can be worked by different strategies, and have multiple correct responses are useful to helping student develop an appreciation for alternative pathways.

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ENGAGEMENT

- Anticipate that students might demonstrate different ways of thinking about, exploring, and engaging in mathematics.

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ENGAGEMENT

"Advancing excellence, access, and equity in mathematics requires the intentional design of lessons, classrooms, and schools where every student experiences belonging, agency, and joy."

(NCTM, 2026)

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THANK YOU!

For the love of math, follow me at

tladams_math

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